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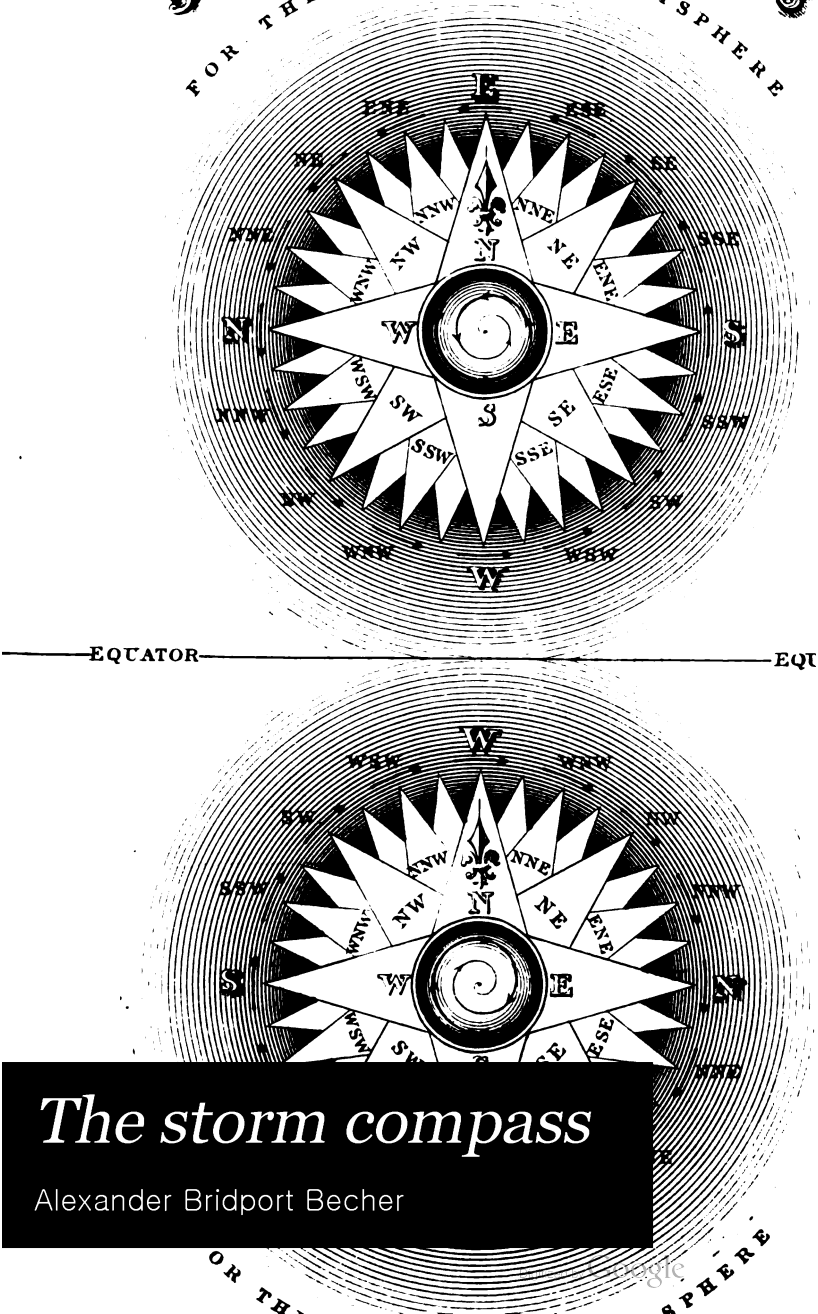

The storm compass

Alexander Bridport Becher

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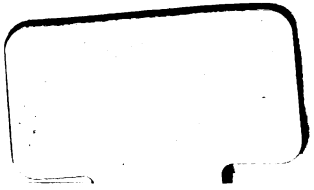

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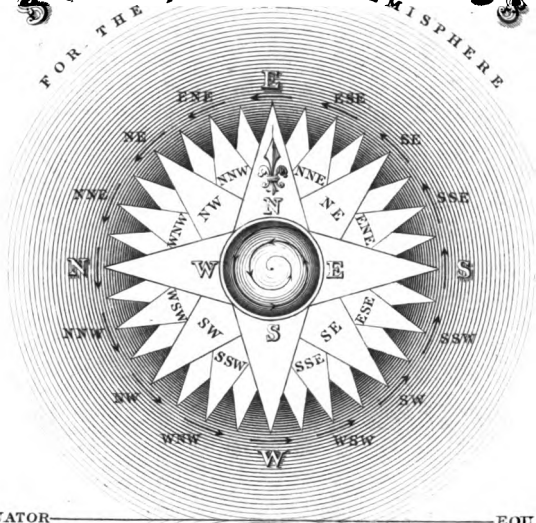
THE

STORM COMPASS

FOR THE NORTHERN HEMISPHERE



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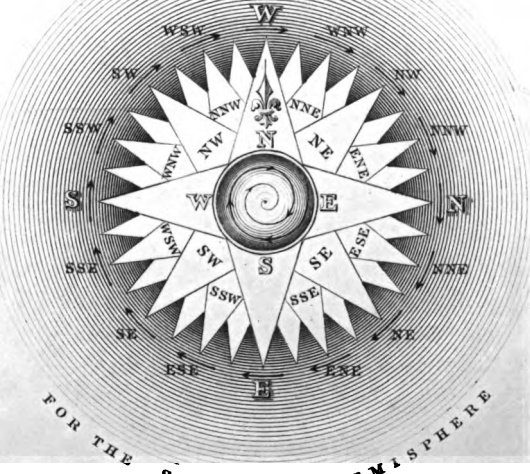

FOR THE SOUTHERN HEMISPHERE

The Compass Point within the arrow representing your Hurricane Wind, is your Bearing from the focus.

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THE

STORM COMPASS

OR,

SEAMAN'S HURRICANE COMPANION:

CONTAINING

A FAMILIAR EXPLANATION OF THE

HURRICANE THEORY,

ILLUSTRATED WITH DIAGRAMS AND ACCOUNTS OF HURRICANES

BY

COMMANDER A. B. BECHER, R.N., F.R.A.S.

——"He who studies Nature's laws,
From certain truth his maxim draws."—GAY.

LONDON:

J. D. POTTER 31, POULTRY,

SOLE AGENT FOR THE SALE OF CHARTS AND WORKS PUBLISHED BY THE ADMIRALTY.

1853.

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PRACTICE

NAUTI

By H. RAPER,

J. D. PO

Sole Agent for the Sale of C

Dear Sir,

Your's truly,

A. B. BECHER.

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TO

CAPTAIN ALEXANDER MILNE

R.N., F.R.S.E. &c.

ONE OF HER MAJESTY'S COMMISSIONERS APPOINTED TO EXECUTE THE OFFICE OF LORD HIGH ADMIRAL OF GREAT BRITAIN.

29, *Upper Gloucester Place, London:*
17*th Dec.* 1852.

DEAR SIR,

In the early part of my naval life, when it was my good fortune to sail with you, the nature of Hurricanes was not understood. Redfield had not provided the seaman of those days with his golden rules, nor had Sir William Reid given him his Law of Storms.

The desire of being useful to our noble profession, by assisting to render these as common at sea as household words are on shore, has induced me to attempt a familiar explanation of them in the following pages, which, in remembrance of other days, are inscribed to you by

DEAR SIR,

Your's truly,

A. B. BECHER.

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PREFACE.

It is with much diffidence that the author of this little volume ventures to offer it to his brother seamen amidst the numerous works already extant on Hurricanes. Encouraged, however, not only by the great importance as well as the simplicity of the subject, but also by the attention which it has now obtained, he is induced to contribute his assistance in explaining those few rules by which hurricanes may be avoided. For, as every year is adding fresh proof of the truth of the Hurricane Theory, so should the knowledge of it become more general among seamen. Happily scepticism with regard to it is gone by: the mismanagement of a ship in a Hurricane belongs rather to the dark passages of our history than to these enlightened days.

Few there are among our seamen, who do not know how ruinous Hurricanes have been to many a "good ship," how fatal indeed to many more. They who have

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escaped their fury by a knowledge of their principles have found how easily they are to be avoided. While to these the pursuit of this important subject may be commended in the elaborate works of Redfield, Reid, Piddington, and Thom, the object of this treatise is to explain those principles in a familiar way to others, who may not yet have given their attention to the subject.

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THE

STORM COMPASS;

OR,

SEAMAN'S HURRICANE COMPANION.

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1. *General Character of Hurricanes.*—The following remarkable facts regarding the constitution of hurricanes, have been well ascertained: That they are monstrous whirlwinds, or revolving storms, the wind of which rushes with extraordinary velocity round a calm focus of variable extent, and towards which that velocity still increases: That while the hurricane wind is thus rushing round its focus, the whole meteor advances bodily onward, at a variable rate, from its birthplace; first *westward*, inclining from the Equator, until at a certain part of its track, it curves abruptly in the opposite direction to that in which it had been moving,

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still inclining more from the Equator: That they recur with remarkable regularity in the same parts of the world about the same times of the year: That they vary in size from a few miles in diameter (even under 50) to several hundred; and,—That the direction in which the hurricane wind blows is always against the course of the sun.

2. *Hurricane Theory established.*—On these remarkable properties, which characterise hurricanes, a theory was founded by which it was considered that ships might avoid them, when they happened to fall in with them at sea; and from which accordingly a few simple rules were drawn up for the guidance of their commanders. Experience has proved them to be good and valid. They have been followed with the most complete success: and instead of enduring all those dreadful disasters, which are too well known, and which were regularly narrated year after year in the public journals; the well-informed commander, by his knowledge of the subject, quickly removes his ship from the limits of their influence, or turns them to a good account when he can get a fair wind from them, without the risk of paying for it by encountering their dangers.

Assuredly a deep debt of gratitude is due to those men, who, by their tact and perseverance, have produced this result; who have reduced disorder and confusion into system and regularity; and who have instructed the seaman how to avoid the fury of the hurricane, as well as how to convert what had been hitherto a source of disaster and loss of life and pro-

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perty, into one of safety and celerity. Never was triumph more complete than that which has crowned their labours. The names of Redfield and Reid should be remembered by seamen of all nations with feelings of gratitude; for by the simple light of truth, which they have thrown upon the subject, they have literally disarmed the storm of its greatest terrors. How many lives would have been saved, had that truth been known in years gone by! how much suffering have been avoided! how many ships, laden with valuable property, have been saved to their owners!

But it is our business to illustrate the hurricane theory; and we will therefore request the attention of our reader while we proceed to consider the several points to which we have above alluded as being the distinctive features of the hurricane. It is proved to be a huge whirlwind,—a circular storm; the wind forming it rushing with extraordinary violence round a centre, it may be at the rate of above 100 miles per hour.

3. *Circular Nature of the Hurricane.*—The circular nature of the hurricane, although noticed by various authors so long ago as the year 1698, seems to have been disregarded until the year 1831, when Mr. Wm Redfield of New York, after a close investigation of the subject, founded his successful theory upon it; and thus enrolled his name among those of the benefactors of mankind. In these days, when we can point to instances of vessels scudding before the wind of a hurricane, and describing figures approaching to circles by

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their tracks, we have good reason to admire the sagacity and perception which foretold such events many years ago. Such was the opinion first promulgated by Mr. Redfield, who added as a certain consequence, that the wind, in its circuit of rotation, must necessarily blow from opposite quarters of the horizon at the same time. Thus was mystery cleared away, and the fact at once accounted for, that while one vessel might be lying to in a heavy gale of wind, another, perhaps not more than thirty leagues distant from her, might be doing the same in the same gale; and yet each of them have the wind in entirely the opposite direction! But Mr. Redfield's theory for a long time shared the fate of many others. It was deemed speculative; seamen were incredulous, and it lay neglected, for no one would believe it, until fact upon fact has established its truth, and forced it into notice.

4. *Hurricane Districts.*—The next step in the theory was, that hurricanes have a progressive movement, which leads to the consideration of the storm tracts, or the parts of the world which they frequent, and the paths which they follow therein. Originating a few degrees on each side of the equator, the first portion of their track assumes a westerly direction, when, as if they had reached the western limit assigned them, they make a sudden curve, and continue on in nearly the opposite direction to that in which they had been moving; and still inclining more from the equator towards the nearest pole, until they become exhausted.

5. In the Atlantic Ocean, it is shown by Redfield,

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that their average place of commencement is in the lat. of 15° N., and long. 55° W., or about N.E. from the island of Trinidad. From thence they pursue a W.N.W. course, until arriving near the coast of Florida they follow the course of the gulf stream to the N.E., sweeping past the coast of the United States, and continuing far beyond the eastern limits of Newfoundland. Some originating south of those, have maintained their western course beyond the Gulf of Mexico; and others again north of them, have assumed their N.E. course, passing between the Bermudas and the American coast. But the North Atlantic hurricane mostly commences N.E. of Trinidad, within the parallels of 10° and 20° N., and between 50° and 60° West longitude.

6. In the Southern Indian Ocean the place of their birth appears to be in the neighbourhood of the Cocos Islands, nearly S.W. from the Strait of Sunda; or in about 10° S., and between those islands and the meridian of 90° E. Their course from thence is about W.S.W., until arriving in the neighbourhood of the Mauritius, they recurve towards the islands of St. Paul and Amsterdam to the S.E.

7. There are few [illegible] however, without exceptions. Although the foregoing are the usual limits of the tracks of hurricanes in the Indian Ocean, some instances are on record of their being met on their southern course between the meridians of 85° and 90° E. These are very rare, but another has just been added to them in the case of the *Equestrian*, which we have preserved in the sequel. And they prove the necessity of ships

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being prepared to find them moving south in the hurricane season so far to the eastward as 90° E.

8. In the ocean west of Australia, they have been met with; but there are not sufficient observations collected from which to deduce their track.

9. In the Bay of Bengal they seem to originate in its eastern portion, and also midway between the Andaman Islands and Ceylon, or in about 10° N. lat. The former assume a N.W. track, and the latter move W.N.W., towards the continent of Hindostan.

10. Those of the China Sea come next under our consideration. They appear to commence within the parallels of 10° to 20° N., but always on the eastern limits of that sea. They assume a course varying from W.S.W. to W.N.W. and even far to the northward and southward of those bearings at different periods of the year. But the regular curve to the northward, apparent in the North Atlantic hurricanes, is not found in those of the China Sea, whether from the variety of currents to which this sea is subject, so different from the Florida Stream, enticing the course of the Atlantic hurricanes, or whether from the formation of the coast being unfavourable to such a N.E. course, does not now concern us.

11. Of the Pacific hurricanes little or nothing is yet known, either of the seat of their origin or their general track. But, that they visit the islands, spreading destruction around them with all that terrific violence for which they are so celebrated, is very well established.

12. We are assured, in the *Nautical Magazine*

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for June, 1852, p. 333, by Colonel Sir William Reid, the present Governor of Malta, that the Mediterranean is no exception to the general laws of hurricanes. The observations of that accomplished officer, indefatigable in the investigation of this subject wherever he may be placed, have led him to the conclusion that the Mediterranean hurricanes assume about a N.E. course in common with those of similar latitude in other seas.

13. Thus it is clear from the foregoing, that these storms, from their very commencement, have a progressive movement, in general westerly, inclining from the equator; and, in the principal great oceans, that they return eastward towards the Poles. At first their rate of advance is slow, varying from four or five to ten miles per hour. They also gradually accelerate their progress to twenty and even thirty miles per hour. But they are tardy and dilatory in their early track as well as in their curving, and instances are recorded of their remaining stationary above a whole day, as if spell-bound to a particular spot; and of their even receding a short distance on their course; the wind all the time blowing with irresistible fury round the vortex, blending sea and clouds in one confused mass; when, having exhausted their fury, they tear themselves away from it, as if reluctant to leave it, and follow the usual course of the rest.

14. *Periods of Visitation.*—They also recur with remarkable regularity in the same parts of the world at the same times of the year; mostly in the autumnal months, or about the time when the sun is returning

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towards the equator from the summer solstice. In the northern hemisphere, these are from about July to October; and in the southern hemisphere from December and January to April.

15. *Magnitude.*—As much variety prevails in their size or the extent of surface over which these storms prevail, as they roll onwards on their desolating tracks, as it does in the rate at which they progress. It is credibly asserted, that they vary from 50 to above 1,000 miles in diameter, and that they also expand and contract in their course. In all the oceans in which they prevail, they have been found varying from one to several hundred miles across the storm circle.

16. *Direction of the Hurricane Wind invariably against the Sun.*—But no bane was ever sent to man without its antidote by an all-wise and merciful Providence. So the hurricane, with all its terrors, affords another instance of that protecting influence which the great Creator of the universe has shown in his most terrible works. In the very simplicity of the hurricane, complicated as it may at first appear, the seaman finds his safety! Irregular or variable as it may be in its force, in the rate at which it progresses, in the course which it assumes, in the times of its recurrence, or in the extent of surface which it covers; let the seaman remember this certain truth, let him treasure it in his memory as the first grand principle on which he may build his safety, that *the hurricane wind invariably blows against the sun.* It is this great fact which is of so much importance to him, because with the

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knowledge of it he may take advantage of his enemy. He is no longer in the dark as to his character and intentions. Prepared with this infallible law, he may stand away from the limits of the hurricane, and place his ship beyond the reach of its violence; or he may lay her by the wind on the safe tack; or, with good management, he may turn it to account, by making a fair wind of it for his port. All this has been done! but it has been only done since the obscurity, in which the subject lay, was cleared away by the persevering exertions of Redfield and Reid. That huge meteor, whatever may be its cause, whatever may be the conflicting forces by which it may have been produced, which stalks over the surface of our globe as a giant in his course, dealing ruin and destruction alike at sea as on shore, and the violence of which nothing can withstand, is a revolving storm, robbed of its greatest terrors to the intelligent mariner, who knows that the first principle of its constitution is its unerring rotatory movement, always in the direction against the apparent course of the sun.

We may lay some stress on this principle of the hurricane; but it is well worthy of it, for in it consists the whole. And how small is that! We well remember a favourite observation of one of those formidable gentlemen of the long robe, of our early days, who could see into subjects further than his short-sighted pupils. Many a time has he wound up a peroration to them tedious enough, on some point of instruction, by the pithy conclusion,—"Sir, the whole thing lies i

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a nutshell!" No doubt he was right; and so it is with the hurricane. This principle of the hurricane is to the seaman a great fact in this age of facts. It is easy to remember that the wind of the storm circle next the equator (on both sides of it) always blows against the sun. A schoolboy, as he is whipping his top, has before him a good practical illustration of this principle of the hurricane; and it would be still better, in these our northern latitudes, should he happen to be left-handed, because the gyrating motion of the toy, like that of the hurricane wind, would then be against the sun, as it is moving onward under each stroke which it receives.

18. Considering then the hurricane to be composed of a considerable body of the atmosphere moving with great velocity round a centre, forming a circular storm, and as having at the same time a gradual progressive movement in a certain direction, the wind experienced by a ship in different parts of this storm circle will not only be found blowing in different directions, but the changes of the wind, also, arising from a change in the relative positions of a ship and the centre, will take place in different directions in different parts of it. How these changes do take place becomes, therefore, a subject for our first attentive consideration. It will be seen that they depend on the relative positions of the centre or focus and that of the ship in the storm circle, and are therefore affected by the direction in which each is moving.

19. The course of the wind describes a circle, or a

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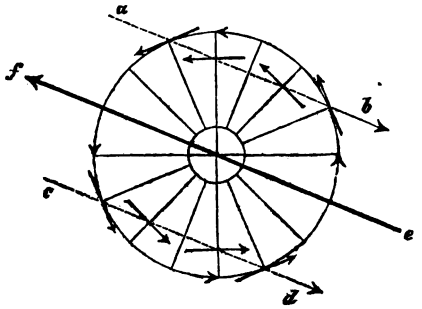
figure so nearly approaching one that it may be safely considered as a circle. Therefore to illustrate the case, let us describe a circle, and suppose it to represent the



circular storm, with the centre as its focus. We must also suppose that the whole area of the circle (which may be 50 or a thousand miles in diameter) is occupied by the wind rushing continually round the centre in the direction of the arrow-heads marked on the circumference. Let us now fill our circle with the points of the compass, and then draw a line, as *a b*, across it to the north of the centre; and another, *c d*, to the south of it. Then if we suppose each of these lines to represent the track of a ship, assuming that such would be possible, passing from *a* to *b* and also from *c* to *d*, and that the storm has no progressive movement, the line *a b*, north of the focus, we find intersects all the points beginning with N.N.W. and ending with E.N.E., and that south of it intersects all those beginning from W.S.W. and ending with S.S.E.; the

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former in the order from *left to right*, and the latter from *right to left*. Now instead of *a b* and *c d* being the tracks of ships *moving through* a circular storm while it is stationary, if we suppose the storm to be moving in the opposite direction, as in that shown by the arrow *e f*, and the ships to be stationary, the same result would follow. And if instead of the compass points we have stated, we take the hurricane winds at those points, as denoted by the direction of the small arrows at each of them, in conformity with the circular course of the hurricane principle, and refer them to the compass points, the changes north of the focus would be from E.N.E. to S.S.E.; and those south of the focus would be from N.N.W. to W.S.W.;—from left to right in the former case, and from right to left in the latter, as before. We have not filled up the minor points; those we have adopted being sufficient to illustrate the subject. All the rest can be done at pleasure by any one on an extended scale.

20. Sir William Reid, with the view of explaining in his Law of Storms how to avoid the focus, has considered the whole hurricane to be divided into two semi-circles, by the imaginary line which the vortex or centre describes, as it advances on its course; (as *e f* in the above figure); and has named that one the right hand semicircle which would be on the right hand of a person looking in the direction of that course, (from *e* to *f*), and the other the left; in the same manner as the right and left banks of a river would be so called by a person passing down it *with the stream*. Hence

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the course which the focus of a hurricane is following, becomes a question of great moment. It may be inferred from repeated observations of the changes of the wind, due allowance being made for change in the position of the ship. But a tolerably sufficient conclusion respecting it, especially for avoiding it, may be gained from a knowledge of the usual course of hurricanes in the locality where it is met. The right and left semicircles, as the focus moves on, always remain the same. Then referring to the foregoing illustration, the track north of the focus, it will be seen, falls in the right hand semicircle; and that south of it would be in the left hand semicircle of the storm. So that the changes of the wind at any stationary point in the right hand semicircle of circular storms as they move onwards are from *left to right*, and in the left hand semicircle from *right to left;* or in opposite directions on opposite sides of the focus. This law holds good in whatever direction the storm may be moving in either hemisphere. But if a ship were to run into a storm in the direction in which it is moving, and could sail through it faster than it moves, the changes of the wind would then be reversed; that is, in the right hand semicircle they would be from right to left, and in the left hand from left to right, let the line of progression or the track of the centre which divides the right from the left semicircle be in whatever direction it may.

21. It may be also seen by the foregoing, that if a ship be sailing with the hurricane wind in the same direction and at the same rate as that at which the

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hurricane is moving, every thing continues relatively the same, and therefore no change of wind will be experienced. But as soon as a change takes place in the rate of either, a change of wind would follow. Again, a ship might be in the direct line in which a storm is advancing, but before it; while she remained so she would have no change of wind, until the focus came to her, when passing that, the wind would come in the opposite direction to that from which it had been blowing. But at sea ships are *never* stationary, and more especially in hurricanes. Not only is the wind driving them about in the storm circle, and clipping their wings, but should these be all gone the current produced by the force of it is drifting them towards the focus. So that at all times when once within the limits of the hurricane, their change of place is perpetual, producing, sooner or later, a change of wind; and the nearer they are to the focus, and the further they are from the line of progression on which the focus is moving, the more rapidly will those changes take place.

22. As the anterior or foremost verge of a hurricane depends on the direction in which the whole of it is moving, and as the same hurricane moves in different directions in different parts of its track, a vessel in the line of that track would have different winds at different parts of it. Let us consider the West India hurricane, moving W.N.W. in the early part of its course N.E. of Trinidad or St. Thomas's. The foremost or leading *wind* then is N.N.E.; (see the above figure;) but when it has curved to the northward and

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is travelling north-eastward, the leading wind becomes S.E. Or, let us take the hurricanes of the Indian Ocean. They move as far as Rodriguez or Mauritius about W.S.W., and their leading wind would be S.S.E.; but suppose the same storm to be moving south, as it does where it curves to the southward, its leading wind would then be east; and when moving S.E., its leading wind would be N.E. Therefore the general tracks of hurricanes should be well studied, and the seaman would do well to insert them on his charts with the season of their visitation, so that when he is in their locality he may arrive at some tolerably accurate conclusion of his position with respect to the focus after a change of wind. We recommend the seaman to study the foregoing well, and not to leave it without understanding it thoroughly. For when he does, after he has had the first change of wind in a hurricane he will be at no loss, which ever way the centre may be moving, to determine whether he is in the right or left hand semicircle of the storm.

23. Another point yet remains to be noticed in the effect of the hurricane wind. It is well known that the wind at all times has a considerable effect in producing the surface currents of the ocean. So powerful a force does it exert in the hurricane, that it has been known to drift a ship at the rate of ten miles an hour! and for nearly two days a ship has been drifting at the rate of five miles per hour. This should serve as an additional warning to the seaman to avoid nearing the centre, and induce him to carry sail and remove his

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ship beyond the limits of this current while he can do so, before it is blown away from her yards, and she lies helpless at the mercy of an overpowering sea. This cross confused sea, known as the hurricane wave, is another result of the effects of the wind. The following extract, from the *Shipping Gazette*, gives an instance of it. "Left Pondicherry, Oct. 14: experienced some very heavy weather from Nov. 4, in lat. 5° 18′ S., long. 88° 44′ E., until the 15th in lat. 14° 33′ S., long. 81° 15′ E.; in fact, a hurricane was raging in our path. Having got the wind from the westward, we kept under low sail, and so avoided the strong wind, *but not the swell, which caused the ship to lay bowsprit and forecastle in;* at times it veered as the wind would, viz., from S.E. to south, and S.W., and we came off with a sprung foreyard only." This ship was on the safe side of the storm.

24. *Signs of the approaching hurricane.*—We need scarcely allude to the prognostics of the hurricane. These are well known to the seaman. If on his voyage, his first consideration should be, whether his ship is in one of the hurricane districts? whether it is the season of their visitation? and if it should be, the general appearance of the weather, the state of the horizon, the appearance of the sun and moon, the state of the sea, and above all the state of his barometer, would claim his especial attention, the mercury of which, he very well knows, by its minute changes within the tropics, indicates as truly the approaching storm, as it does by its greater changes in higher latitudes. Should

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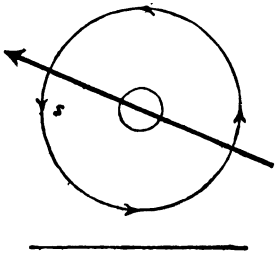
he find sufficient reason from these signs of the times about him, he immediately takes a seaman's precautions for bad weather, making a snug ship below and aloft, and has recourse to the theory. In doing this, he has first to determine the direction of the focus from him; thence whether he is in the right or left hand semicircle, in order that he may know how to avoid it.

25. *To find the bearing of the focus.*—Now the direction of the centre or focus of the storm from him, he may find by this simple process. As the course of the wind of the hurricane describes a circle, he makes one roughly with a pencil on a leaf of his watch-bill or something handy,* marking a centre to represent the focus; and, supposing him to be in north latitude, he draws a line *beneath* it to represent the equator, making that portion of the circle next to it, the south part of the hurricane. He will then mark an arrow-head on that part of the circle nearest the equator, pointing to the *eastward*, to indicate the course of the wind blowing from west or against the sun; and, completing the circle at the other cardinal points, by marking the arrow-heads as following each other, he will have on the east side of his circle, the arrow pointing north; that on the



* A piece of chalk on a board would answer as well.

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north side pointing west; and that on the west side pointing south; each showing the wind to be blowing from the opposite direction to that to which they point; and blowing, as in fact it does, in opposite directions on opposite sides of the hurricane.

26. By the time he has made a snug ship and completed his hurricane circle, or we may call it his storm circle, the wind has freshened up from a light or a moderate breeze, to the first salute of the hurricane, and the question with him then, is, How is the wind? Let us suppose the answer to be, North; then, referring to his storm circle, he finds that the arrow pointing South towards the equator (showing the wind to be blowing from North) is on the West side of it, and that, therefore, the centre bears due East of him, and he must, therefore be on that part of the storm circle where we have marked the letter *s*, at a distance from the centre which is uncertain. The reason why it is so, is this: he must first consider himself on a circle, because the course of the wind describes a figure so nearly approaching that of a circle, that it may be safely considered as one: then as he is accustomed to consider the course of the wind as a rhumb line, a tangent to his circle is drawn to represent it, but it must be from North to South because the wind is North; and this can only be done at West: for, as on that part of the circle nearest the equator the wind is from West, and on the East side of it the wind is from South, and on the North side of it the wind is from East, it can be from North only on the West side

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of it, since the course of the hurricane wind describes a circle. Therefore a tangent to it drawn *from* North to South, *with the wind*, to represent its direction, can only touch the circle at West, from whence the centre or focus must bear due East. Suppose the wind was N.E.; a line drawn *from* N.E. to S.W., with the wind to show its direction, could only touch the circle as a tangent at N.W., from whence the focus must bear S.E. Or suppose the wind to be N.W., a line drawn *from* N.W. to S.E., with the wind, could only touch the circle as a tangent at S.W., making the focus bear N.E.

27. Now we recommend this process for ascertaining the direction of the focus to the particular attention of the seaman, because it makes him entirely independent of all other reference whatever. By drawing the line which is to represent the equator, either under or over his circle, rough as that may be, according as he is in north or south latitude, and completing the arrow-heads on it, as above-mentioned, to represent the course of the wind, *(always marking that nearest the equator as coming from the West, whether he may be in the North or South latitude,)* he has a sufficient representation of the hurricane wind; and by the direction from which he has this wind, he readily singles out the part of the hurricane circle to which a straight line from that direction must form a tangent, and which at once gives him his bearing from the focus; or by taking the opposite point he has the bearing of the focus from his ship. By accustoming himself to per-

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form this little operation, he soon does it with facility and readiness. Knowing how the wind blows, he knows at once the direction in which the focus bears from him, with no other means than those which every one has at command.

28. Various have been the methods proposed for performing this first operation of ascertaining how the focus of the storm bears*. Without depreciating others, we prefer this because it appears to be the most simple and self evident. To refer the seaman straightway to his compass, is to refer him to his best friend, his guide and his companion wherever he may be. We have, therefore, converted it for him into a STORM COMPASS for both latitudes, by merely doing what we have here been recommending him to do, in completing it at each of the principal points with the hurricane wind which is found there. Any minor point he may fill up at pleasure. For instance, if he be in South latitude, the wind between W.S.W. and S.W. in the N.W. part of the hurricane circle would be S.W.b.W., and he would be N.W.b.W. from the focus; or it would bear S.E.b.E. of him. He will soon be independent of it, as he should be, for it is not a time to refer to books and tables, when he has so simple an affair to accomplish as to find the bearing of a storm's centre.

29. The direction of the focus ascertained, it next becomes necessary to consider where the ship is; what part of the storm tract she is in; for, as the hurricane is moving onwards westerly, with the wind at North,

* Note 1, in Appendix.

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she must be somewhere in front of it; and as it will come upon him, for it frequently travels faster than his ship can sail, it becomes the seaman's first business to avoid it, but at the same time if he can to turn it to his account in doing so.

30. Let us suppose the ship to be two or three days out from Barbados on her voyage to Jamaica. Then referring to his position on the chart, he finds himself not far from where these storms commence, and where they travel W.N.W., and he sees at once that with the wind at North, the focus is due East of him. He then draws a W.N.W. line passing through the centre of his circle to show the probable direction in which it is moving; which line determines the two great divisions of the storm as we have already explained (art. 20), and he finds that he is to the southward of that line in the left hand semicircle of the storm. The question is now whether he will lay by and let it pass, or stand away from it to the southward; for to attempt to run with it as a fair wind would, sooner or later, involve him in difficulty. He would be unable to run long, as the wind would head him, and he would very soon be in such a sea as would render his ship unmanageable.

31. But his object should be to get away from it, and, therefore, with the northerly wind which he has, it is evident that his readiest way to do so, is to run out of his course, without loss of time, a distance of a hundred miles, or even more if necessary, to the southward, and lay his ship by until his barometer, by its rising, gives notice that the hurricane has passed him.

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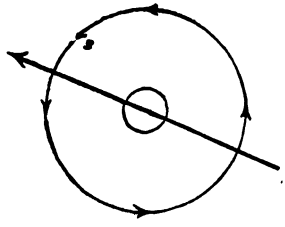
In laying his ship by the wind, the rule is to adopt that tack on which she will come up by its drawing aft. If the wind continue northerly, by the time she has got to the southward she would lay by with her head to the eastward, but it would be more probably westward of north by the focus advancing to the westward, and would assuredly go off at west or to the southward of west.

32. Thus with the bearing of the focus found from the direction of the wind and the knowledge of the usual track of hurricanes in the latitude and longitude which he is in, the seaman can determine, almost with certainty, whether he is in the right or left hand division of the storm. But before he has run long in the manner above recommended a change of wind would confirm his conclusion.

33. But let us suppose another case: let him have the first increasing wind at N.E. The storm compass shows us that, with the wind at N.E., the centre of the hurricane bears S.E., he would be at *s*, on the storm circle, and therefore a vessel thus situated is on the foremost verge of it, in the right hand semicircle with the whole of the storm overtaking her. Now if the port tack be adopted here, the wind being at N.E., the ship would lay E.S.E.; but that course would be directly meeting the focus of the



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storm, and she would inevitably run into the heart of it, because it is advancing W.N.W. upon her; and although she could only lay N.N.W. on the starboard tack, as the focus advances the wind will draw aft, and enable her to make good progress to the northward and eastward. As soon as she can do so she is safe, and may lay by till the barometer indicates by its rising that the storm has passed away to the westward. It is at all times a hazardous experiment to run across the front of a storm, for the sea may increase so much, as well as the wind, that a vessel may become unmanageable, and she then runs the risk of being thrown into the vortex. But there are conditions in the *early* part of it when it has been done with impunity.

34. As good example affords good precept, we will now add some instances of the good effects of observing the theory. The following account of a hurricane experienced by the barque *Mexicano*, in the Gulf of Mexico, which appears in the *Nautical Magazine* for the year 1838, is a good illustration of what we have advanced. Her Commander says:—

During my stay on the Mexican coast, in August and September, 1837, the weather was very unsettled, hazy, and cloudy, with light winds and calms, accompanied by great heat. While loading in September, the wind was very variable, often from S.W. occasionally a fresh breeze. At times the water rose and overflowed the streets in the town; the current, too, was running stronger than I had ever seen it on any former occasion. There was very little variation in the barometer, which I carefully watched, being from the cir-

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cumstances above-mentioned suspicious of a gale. On the 25th September, made sail from the Mexican coast, beating up along shore; the winds light and variable, interrupted every day by tremendous squalls, accompanied with much thunder and lightning. 28th September, noon, lat. obs. 21° 50′ N., long. by chro. 90° 04′ W.; bar. 30·15; therm. air 88°, therm. water 85°.

29th September. Gradually increasing breeze from E.N.E., accompanied with a heavy swell from eastward. Tacking as necessary. Bar. falling; lat. obs. 21° 50′ N., long. chro. 89° 33′ W.; bar. 29·98; therm. air 84°, therm. water 82½°.

30th September. Commences strong breeze from N.E., with heavy swell; wind increasing during the night. Reefed topsails. Tacking as necessary. 4h. 30m., A.M. Sky very much overcast, wind increasing; bar. falling, at 29·65, very low for the tropics; everything prognosticating a gale. Called all hands; prepared for a gale; sent in flying jibboom, down top gallant masts, and housed mizen top-mast. Passed fresh lashings round every thing on deck. Busy till noon shortening sail gradually. Noon under close reefed main top-sail. As the sails were furled, lashed them extra with lines. Lat. obs. 22° 14′, long. chro. 89° 33′ W.; bar. 29·60; therm. air 82°, therm. water 83. Ends with strong gale from N.N.E., with heavy sea; hove to on starboard tack.

My reason for this was twofold; I had once formerly homeward bound from the West Indies, experienced a hurricane; the wind then blew hardest from E.S.E., and gradually veered round to S.E., S., and S.W. Should the wind follow the same course on the present occasion, (which it ultimately did,) the vessel on the starboard tack would come up. Besides, on this tack she would drive clear of the Alacran shoal better than on the other.

1st October. Gradually increasing gale, with a heavy

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cross sea. 8 P.M., blowing a hard gale; wind veering more to eastward, very heavy sea. Barque labouring heavy, straining and making water; pumps carefully attended. Daylight, called crew aft, and battened down forecastle hatch. Wind at N.E., gale increasing, barometer falling at 29·55. 11 A.M., wind at E.N.E., tremendous gale; clewed up and furled main top-sail with much difficulty: impossible to set any sail. Barque labouring very much, lee side completely under water. Noon, wind at east, a hurricane; bar. 29·50; hands constantly at pumps.

2nd October. Same weather; wind, if possible, increasing towards 4 P.M.*, awful gale; impossible to look to windward: sea constantly breaking over the barque; caboose washed down against lee fore-rigging, galley blown to pieces; swinging booms, hen coops, pig-sty, and lots of lumber, washed overboard. Bulwarks going away at various times. Barque forced down at times, till water entered the launch. Seat carpenter to cut two large holes in launch's bottom to allow the water fair play. Weather part of fore-sail blew adrift, went to pieces; top gallant steering sails, &c., blown adrift. 4h. 30m., P.M., heavy sea struck barque by main rigging; carried away great part of bulwarks and part of rail; started stancheons and about a dozen treenails in starboard upper works; in doubts as to barque's living much longer. During night hurricane continued unabated. Daylight, squalls not so heavy; wind veered to E.S.E. and S.E.; got two hammocks in mizen rigging, to keep her head to. Ends with wind at S.E., tremendous gale, but decreasing. Barometer rising since daylight. Lat. D.R. two days 23° 20′ N., long. chro. D.R. 90° 19′ W.; bar. 29·70. During these twenty-four hours pumps never sucked.

* This I consider the crisis.

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NOTE.—Yesterday I did not put down the latitude and longitude. I calculated it roughly in my own mind, and satisfied myself the barque was driving clear of the shoals; I was too much occupied, both mentally and corporeally, to enter into minute calculations.

3rd October. Gale still raging, wind from S.E. 4 P.M. hurricane broke, still heavy gale; set main trysail and topmast staysail. Continued heavy sea; barque labouring very much. Daylight, decreasing gale; a solitary speck of blue sky perceptible. 8 A.M., set fore trysail. Noon, set reefed spanker. Ends hard gale and cross sea, wind at S.E. Sun peeped out long enough for us to obtain sights for chronometer and latitude; found allowance of drift and leeway, during past two days, nearly correct: viz.—2 knots per hour, and 5 to 5½ pts. leeway. Lat. D.R. 24° 14′, lat. obs. 24° 16′, long. D.R. 90° 31′, chro. 90° 36′ W.; bar. 29·90.

4th October. Strong gale; wind throughout 24 hours from E.S.E. to S.E., with the most irregular heavy cross sea I ever experienced. Barque labouring very much. 5 P.M., wind more moderate; set close reefed fore and double reefed main topsail. Ends strong breeze with heavy sea; wind S.E.b.E.; lat. obs. 25° 10′, long. chro. 89° 50′; bar. 29·97; therm. air 84°, therm. water 82°.

5th October. Gradually decreasing breeze, but heavy sea, preventing our making sail; wind throughout from E.S.E. to S.E.; ends fresh breeze, under single reefed topsails, and courses; lat. obs. 26° 13′ N., long. chro. 88° 38′; bar. 30.05; therm. air 84°, therm. water 82°.

6th October. Fresh breeze throughout, with heavy sea; wind P.M. from S.E., A.M. veering to S.S.E. and freshening, with heavy sea; on mainsail and jib and double reefed the topsails; lat. D.R. 26° 58′, obs. 26° 58′, long. D.R. 87° 10′, chro. 87° 4′; 30 miles westerly current. Three different sets

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of sights taken for watch; bar. 29·96; therm. air 86°, therm. water 83°. Barometer again falling, with a heavy swell rolling along from S.W.; anticipate another breeze from that quarter: down top gallant yards and made snug.

Saturday, 7th October. Commences with a fast increasing breeze from south, veering during the night to S.W., when it ends at noon; fresh gale and very heavy sea. Barque labouring much. Sky clear. Again a considerable westerly difference in reckoning; lat. obs. 26° 32′, long. D.R. 86° 32′, chro. 87° 06′; bar. 29·78; therm. air 82°, therm. water 82°.

8th October. Breeze decreasing fast: 6 P.M. moderate, out all reefs; crossed top gallant yards and set steering sails. Afterwards weather continued fine; saw several vessels under jurymasts.

I am an advocate for temperance in all things, especially in drinking; so much so, that I have not tasted spirits for several years; but I would just ask some of those worthy advocates of *total abstinence*, whether they think, under the circumstances I have narrated, during the hurricane, when we were forty-eight hours without fire, that the men could have endured the fatigue at the pumps, &c., on flinty biscuit and cold water? All huddled together in the cabin, the rest they had was lying on the cabin deck in their wet clothes, one gang constantly at the pumps, or at least as constantly as the sea would permit, washed frequently down to the lee scuppers by the sea, and bruised in every way. Nature could not have stood it unsupported; I served out a liberal allowance of spirits, wine, &c.

I may also remark the needfulness of the barometer; it undoubtedly saved the barque considerable damage, probably the loss of masts, by warning me of the coming gale, for

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which I was prepared. Yet, at the present day, I know several masters of merchantmen who deny its efficacy!

35. We considered the management of the *Mexicano* as highly creditable to her commander, and we find the following remarks made by us on the whole subject in the *Nautical Magazine*, so that our opinion of it stands recorded fourteen years ago.

There is no doubt that the attention of the commander of this vessel to the barometer, and laying her to on the starboard tack, were the means of saving her from destruction. Many a loss we fear takes place from the want of such precautions, and the *knowledge* by which they are determined on.

The request of our correspondent will, no doubt, meet the attention which he asks; and in the mean time we may observe, that he did perfectly right in laying his vessel to on the starboard tack; the changes of the wind to the eastward showing that the focus of the hurricane would pass to the southward of his position. By adopting this tack he not only had the advantage of the wind drawing aft, but also forged a-head further from its track. Had he laid his vessel to on the port tack, it is more than probable she would have been lost. In the other case, also, he was gaining sea room. The course of this hurricane appears to have been about W.N.W. Had the wind, when it commenced on the 30th, drawn to the northward, and to N.W. and W. successively instead of to the Eastward, it would have shown that the vessel was to the Southward of the hurricane's track, and then the port tack would have been the proper one to have brought the wind on, as it would then also have drawn aft.

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hese are important points for the consideration of the Commanders of our West India cruizers: indeed Mr. Redfield's theory should be carefully studied; and no Captain is fit for his command, unless he thoroughly understands it, and can turn the knowledge of it to account in the proper disposal of his vessel in a hurricane.—ED. *N.M.* Such were the opinions expressed by the Author of these lines when the hurricane theory was still new, and was undergoing the scrutiny of observation; having to contend, as a matter of course, with that prejudice which assails any thing new. The experience of every year since they were recorded has confirmed them.

36. The circumstance of a packet avoiding a hurricane, while on her passage between Nassau and Bermuda, is advanced by Col. Sir Wm. Reid*, as "an instance of good management in the speed of a steamer being judiciously slackened to prevent her being plunged into the vortex of a storm, in the case of the West India Mail Steamer *Medway*, commanded by Captain Andrews, in September, 1846. This packet was on her passage from Nassau, in New Providence, to Bermuda, at the time when a storm coming from the southward was passing between those two groups of islands. The Commander of the *Medway*, perfectly well understanding the nature of the storm he was approaching, and knowing his position with relation to the storm's centre, took in his sails, struck his yards, and hove to, waiting for the wind, which was N.E., to veer to N.W., as he knew it would do. He then

* Note 2 in Appendix.

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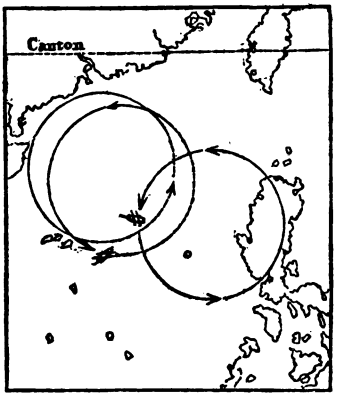
bore up, ran round the hindermost portion of the storm for Bermuda, and arrived there without sustaining any injury whatever." He was, in fact, in that part of the hurricane track where these storms follow generally a N.W. course. It may also be observed that the *Medway* had the advantage of the storm wave drifting her to the southward of the path which the storm was following, and thus giving her additional assistance in getting behind it.

37. Another instance of good management of a ship in a hurricane which is quoted by Colonel Sir W. Reid in the same work, originally appeared in the *Nautical Magazine*, which, the Colonel observes, "has largely contributed towards advancing our knowledge of the law of storms." It was communicated to that Journal by the Commander of the *Black Nymph*, and appears in the volume for the year 1847.

Sir Wm. Reid says:—

Barque Black Nymph.

I shall conclude this chapter on the gales of the China Sea with Captain Hall's interesting account of the way in which he avoided falling into the heart of one of these gales. I have taken this account from the *Nautical Magazine*, a periodical publication which has largely



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contributed towards advancing our knowledge of the law of storms. The circles in the above diagram are intended to represent that gale coming from the south-eastward. The ship *Black Nymph* is marked as on the starboard-tack, receiving the wind in the first instance at north, and afterwards, as the storm advanced and the ship went a little a-head, receiving the wind at W.N.W. The dotted portion of the third circle will show how the ship at last would have the wind W.S.W.

Captain Hall says:—"When three or four days' sail from Macao, about noon, I observed a most wild and uncommon looking halo round the sun. Next day set in with light squalls, smooth water, but strong ripples. The afternoon was remarkably fine; but, casting my eye on the barometer, I saw it had fallen considerably since noon. I thought at first some one had meddled with it, though, looking again half an hour afterwards, I was convinced it was falling rapidly. Still the weather seemed very fine, and I thought it strange; but I was inclined to trust to my old friend, which, by its timely warnings, had saved me many a sail and spar before, and at other times had often enabled me to carry on through an uncomfortable looking night. On this occasion it proved itself worthy of trust, and I should have had cause of regret had I neglected its warning, and trusted to appearances only. About 3 P.M., the barometer still falling, though the weather continued fine, I ordered the crew, employed in cleansing the ship and preparing for harbour, to strike top-gallantmasts and yards, mizen-top-gallantmast and jib-boom, the sails and rigging of which I put *below*, and, indeed, divested the rigging aloft of all top-hamper, and everything that could be spared. Secured sails and hatches, close-reefed the topsails, and boats hoisted on board, and well secured.

Weather fine, but Bar. falling.

Still falling, and weather fine.

"Done beforehand, all was done quickly and well. I dare

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say *Jack* thought it funny work making all this preparation on a fine afternoon; and some of them looked about, weatherwise, to divine the reason: but in a few hours the most incredulous were satisfied with the prudence of the operations.

Still falling. Quiet succeeded to bustle: and the barometer still falling, I said to myself, 'Now in reality is coming one of these typhoons;' and having previously been led to pay some attention to the subject, I looked to its approach with a mingled feeling of apprehension and curiosity.

A bank rising in the S.E. "Towards evening I observed a bank in the S.E. Night closed in, and the water continued smooth; but the sky

Wind north. looked wildish, the scud coming from the N.E., the wind from *north*. I was much interested in watching for the *commencement* of the gale, which I now felt sure was coming; and considering the theory to be correct, it would point out my position with respect to its centre.

"That bank in the S.E. must have been the meteor approaching us, the N.E. scud the outer *north-west portion of it;* and when at night a strong gale came on about N. or

N.N.W. N.N.W., I felt certain we were on its western and southern verge. It rapidly increased in violence, but I was pleased to

N.W. see the wind veering to the N.W., as it convinced me that I had put the ship on the right tack, namely, *on the starboard tack*, standing of course to the S.W.

"From 10 A.M. to 3 P.M. it blew with great violence, but the ship, being well prepared, rode comparatively easy. The

W.N.W. barometer was now very low, the wind about W.N.W., the centre of the storm passing doubtless to the northward of us, and to which we might have been very near, had we in the first part put the ship on the larboard tack, and stood to the north-east, and towards the centre, instead of on the starboard tack and to the south-west, the opposite direction.

W.S.W. "About 5 P.M. wind at W.S.W., sensibly decreasing, the

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barometer rising. At 6, fresh gale, made sail to keep ship steady; a very great sea on, and towards midnight it became a moderate gale. The wind having now become S.W. to S.S.W., the ship broke off to S.E. Thinking it a pity to be lying so far out of our course, I wore to N.W., and made sail; but in less than two hours heavy gusts came on, and the barometer began again to fall. I now thought, of course, we were approaching the storm again; and, doubtless, the theory is not mere speculation. I wore again to the S.E.; and to show more clearly how great a difference a very short distance nearer to, or further from, these storms makes, the weather rapidly improved. The next morning it was fine and moderate, and the wind became S.E., with a heavy running westerly swell. Until the afternoon there was a dark, wild appearance in the westward, which seemed to me another proof that it was the meteor which had the day before appeared in the S.E., and whose course had been from S.E. to N.W., passing a little northward of our position.

S.W. S.S.W.

Wore, and followed the gale.

Wore again, and kept from it.

"When we arrived at Hong Kong, two or three days afterwards, we found they had had a gale, but not very violent; for the storm was evidently of small extent, and its centre lay between the ship and Hong Kong, through which centre I might have had the pleasure of passing, if, regardless of the indications of the barometer, and the results of the scientific comparison of the data of other storms, I had been eager merely to keep on the tack, the larboard, nearest my course, heading to the N.E., instead of standing to the S.W. I may also add, that though the storm-wave might have been carrying me to the westward, the storm-current certainly swept me to the southward, out of the course of the storm.

Storm current.

"I regret that, being just now at a distance from home, I cannot avail myself of my papers, to give you the exact par-

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ticulars of changes of the wind, barometer, &c.; but this short practical study of a rotatory storm so impressed the principal features of it on my memory, that you may depend on the general accuracy of this rough sketch.

"JOHN VINE HALL."

39. In the early days of a new theory this management of a ship in a hurricane is no less satisfactory to the author of it, than it is creditable to a Commander, to handle his ship in the masterly manner shown in these several instances.

40. Some good practical hints may be derived from all the foregoing examples. The several Commanders had been previously led to consider well the subject of hurricanes. "Certain wild appearances," says Capt. Hall, "induced me to prepare for a storm," which he afterwards saw approaching like a bank. Every thing was done beforehand, and he was, therefore, well prepared. He put his ship on the right tack to get out of the way of the storm, and his barometer rose as he stood to the S.W. from it. Then he looked into it again to the N.W., and found that what he had already experienced was still going on there, so he very prudently turned his back upon his old enemy, who left him the legacy of a heavy running westerly swell, which was the natural effect of the westerly gale on the southern limits of the hurricane. Let the reader observe this is the management of several years ago.

41. An attempt may always be made, as shown by the "*Remarks on Hurricanes*," published by the Admiralty, after ascertaining the direction in which the

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focus bears, to arrive at some conclusion as to its distance; and a tolerable opinion may be formed by the frequent change of the wind, and by its increased force, as these always indicate its proximity. Taking the former, let us suppose a ship to be running west, with the wind at east, by which she knows the focus bears due South of her. Then, having run fifty miles, suppose the wind gradually to become E.S.E., then the focus must be S.S.W. of her. Now, had the focus been stationary it would have been easy to have determined its position by the course and distance and the two bearings. First, on the chart, by marking the position of the ship and the bearing of the focus at North, and again at the end of fifty miles, with the bearing of the focus S.S.W. The intersection of these bearings would give the place of the focus on the chart; or, with the change of two points as a course, and fifty miles as a departure, the distance in the traverse table at the time of the last bearing, would be 131 miles, and at that of the first 121. But the focus is moving about W.S.W., and, therefore, the actual distance is something more than that found.

42. But, with respect to the actual distance which the focus may be from the ship, there is more of curiosity than real utility in knowing it. To determine it with accuracy is best done in conjunction with another ship in the same hurricane, the observations on the wind being made at the same time in both ships. Then if the positions of the two be laid down on the chart and the simultaneous observations of the wind also, its

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relative position may be closely arrived at; and if a third ship should be present all the better; her observations would serve to corroborate the others: but they must be all made at the same time. The barometer offers the easiest mode of obtaining a comparison of its proximity from time to time.

43. The focus of the hurricane is that special part of it which the seaman has to avoid, and knowing its bearing, he sees how it is best avoided. It is there that a ship, after enduring all the severities of the first half of the hurricane, and having experienced the last few more rapid changes of the wind, near the margin of this mysterious circle, where electricity appears to be principally developed, is left by a terrific overpowering wind in a dead calm! where, above, all is peace and tranquillity, and below, a maddened sea raging in turmoil and confusion in huge pyramids, and in motion like a boiling cauldron. In this magic circle the glorious sun may be pouring forth his splendour on the shattered vessel, whitening the foaming sea, and cheering the worn-out crew to fresh exertion in clearing the wreck, and repairing as well as they can the damages sustained, before the second part of the gale comes on. But the sea is such as gives a ship no chance, and should her damages be great, the probability of outliving such a sea, followed by the second part of the hurricane, is slender indeed,—transient as the passing hour through which the vortex may last; when on a sudden on comes the opposite wind and all is lost. By night a ship falls into this vortex attended, perhaps,

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by the lurid glare of electric clouds, a sudden flash acting as if it were a signal for the wind to cease, but momentarily only, for on again will come the sudden change of wind, rendering her condition more dangerous still than the former, by which she may be taken by the lee, and be at once overwhelmed by one of those monster seas that surround her. Or let us imagine the reality of what Lieut. Archer has said in his account of the loss of the *Phœnix*, quoted by Sir William Reid: "Who can describe the appearance of things on deck! If I was to write for ever I could not give you an idea of it; a total darkness all above; the sea on fire, running as it were in Alps or peaks of Tenerife (mountains are too common an idea); the wind roaring louder than thunder (absolutely no flight of imagination); the whole made more terrible, if possible, by a very uncommon kind of blue lightning." Again, an awful lightning may be flying about in all directions, or large balls of meteoric fire may be seen at the yardarms to light the ship into the vortex of the gale, where, amid the mournful sound of the moaning winds, the stars shining through the clear calm space overhead, a short interval is afforded the Commander to survey his shattered vessel, to ascertain the full extent of the injuries she has sustained before the second part of the storm comes on with redoubled fury. Here is ample reason for avoiding the centre of a hurricane. Here is no exaggerated story; all this has happened, all is reality, the plain ungarnished tale of seamen themselves. And would any one in his senses encounter all

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this, and the fearful risk of seeing his vessel founder in it, as too often has been the case, when, by attending to a few simple rules, all of it might certainly be avoided.

44. Lord Byron alluding, in one of his poems, to some flies in a piece of amber, wondered how they ever got there! The seaman whose ship has outlived the trials and dangers of the first half of the hurricane, on finding himself in the vortex, may wonder how he got there and is still above water; but he has to encounter the dangers yet to come.

45. It is also at the centre where the barometer falls to its lowest level, indicating the decrease of atmospheric pressure to be there; a condition which contributes to the disturbed state of the sea that is found there. Now this vortex may be a mere nothing in space, as we have seen, or it may vary from five to twenty miles in diameter, and occupy as much as an hour in passing. Indeed it has been known to last for four hours. But we have dwelt sufficiently upon it to point out its dangers, and we will now proceed to consider the hurricanes of the Indian Ocean, where we shall find matters for consideration as important as the foregoing.

46. We are now South of the Equator, and our Storm Compass for North latitude does not apply here, for matters regarding the direction of the wind are in some measure reversed. Therefore the first thing to be done is to prepare our Storm Compass for South latitude. Calling to mind that invaluable and invari-

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able law of storms, that the wind of the hurricane circle blows always against the sun, we mark the North point of our Storm Compass now with a Westerly wind, and, therefore, the South point with an Easterly wind, and the East and West points with a Northerly and Southerly wind respectively; and we may then fill up the remaining intermediate points, with the others, in their order, as we please. It will then be seen that in the different parts of the hurricane circle, corresponding with that for North latitude, with reference to the equator and poles, the East and West wind remains the same, and with reference to the East and West parts of the circle the wind is reversed:—that which was North is here become South, and that which was South is now North, a change which very materially affects a vessel's proceedings. We have, therefore, supplied the Seaman with a Storm Compass for South latitude, but at the same time recommend him to use his pencil as before mentioned.

47. The principal hurricanes of South latitudes are those of the Indian Ocean, celebrated by the havoc they have made among East India shipping. They frequent a field directly in the track of ships between China, India, and Europe, and have full often, in years gone by, dealt destruction among them. But when it is considered that the track of these hurricanes must be crossed, it is no matter of surprise that it should be so. For a ship from the Strait of Sunda, homeward bound, has the wind fair from the Eastward, to the

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Southward of the track of these storms, and as that curves round to the South somewhere between the meridian of Rodriguez and the Mauritius, and then continues moving on to the S.E., she has to pass through the severe ordeal of crossing the track, possibly in its very bend, rendering her chances worse and making things more complex still.

48. It has been a subject of remark that ships on their way out to India from Europe seldom meet with hurricanes, and the reason is that they generally run down their longitude on a Southern parallel, perhaps as far as St. Paul and Amsterdam Islands, before standing to the Northward; more especially if bound through the Strait of Sunda. By this means they avoid the worst part of the hurricane district, and merely cross it, well to the Eastward, remaining in it the least possible time. If a ship pass near the Mauritius in the hurricane season, standing to the Northward, she might, perhaps, pass in front of a hurricane, and avoid it easily by standing North with the fair Southerly winds forming that part of it. She is in this case on the safe side of the storm. And if another ship, homeward bound, were to meet the same hurricane, the same wind will enable her to steer West, or at least N.W., till she is beyond the limits of it, in the usual trade.

49. It is not so, however, with ships homeward bound from the Strait of Sunda or the Eastern Islands. Their course lies through the whole range of the storm district, and they must be fully alive to those infallible

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indications, to which we have alluded, of the presence of one of these storms, and more especially so in the hurricane season, from December to April.

50. Dr. Thom, in his valuable work on the storms of the Indian Ocean, very properly warns the seaman against becoming involved in one of these hurricanes as he is running to the S.W., with the fair N.E. and easterly winds of it, because it is generally on their southern side that his homeward course lies, and on which side these winds prevail. His barometer will give him timely notice of its approach, so that even a slight fall should induce attention to avoid it.

51. Suppose a vessel to be steering S.W. with the wind from N.E. to East, light at first but gradually freshening so as to oblige her to reduce sail. She is then running in nearly the same direction as that in which the vortex of the gale is moving, and is most probably approaching it, because her track is S.W. while that of the storm is generally W.S.W. She would, therefore, run on into it by keeping her course, because the two tracks converge, and the current produced by the hurricane would assist by drifting her in towards the focus. At first she may be only now keeping way with it, yet, as it decreases its velocity as it approaches to the S.W., she would there overtake it and become involved in all its dangers. Now, the easiest way to avoid this, as soon as the barometer has given its earliest warning by a gradual depression, is to haul out of its way to the S.E., and to stand well on for a hundred miles or so in that direction, and then to lay to under storm sail

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on the port tack until the barometer rises and the storm will have passed on.

52. But suppose a ship to be thus situated with respect to the focus of the storm in about 18° or 20° S., where the progress of it is slow and it is curving to the soutward. This is a most dangerous position, because even lying to on the port tack with the wind at N.E. or east, she would drift to the southward, in the direction in which the storm is moving, and become involved in it; and by making southing she might fall into it in its S.E. progress. She has nothing left her then but to scud as well as she can N.W. across the front of the storm, and when the weather moderates lay to on the port tack for a day.

53. Again, let us suppose a ship running S.W. and the wind from N.E. hauls to S.E. Our Storm Compass at once tells us the vortex is N.E. of her, and she is therefore in the very front of the storm, running in precisely the same direction as that in which it is moving. Therefore lying to on either tack here would be only waiting for the arrival of the focus. If a ship should find herself in this position in the early part of the storm's track in about 10° or 12° S., while the wind is N.E., it would be safest for her to stand to the S.E. on the port tack for a hundred miles or more, and then lay to till it has passed on; but if well on towards Rodriguez, the proper course to adopt with the wind at S.E. is to scud away to the N.W. or W.N.W. as fast as possible and keep to the northward until the barometer gives notice that the storm is past.

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This is a critical position for a ship to be in, but it is clear that she can make a fair wind in either case and run out of the path which the vortex is sure to follow.

54. In further illustration of the subject before us we may take the case of the *Trident*, commanded by an active intelligent officer, Mr. Lyall, that appears in the *Nautical Magazine* for July last. This vessel on her way to China had the brush of a hurricane, which appeared to be one of those which sweep over the Mauritius, and she seems to have had the good fortune just to cross the path of the focus at a place which it had not then reached and thus to gain the north side of the storm in its progress to the S.E. Her commander says:—

On the 9th we had a gale at N.E. or N.N.E., on that morning the wind had suddenly increased, and the sky overcast; bar. 30·2; ther. 71°; the air was very sultry, and had a strange oppressive feel; there were curious and sudden transformations among the clouds, but it soon became thick, with drizzling rain and strong gales. A little before noon the bar. and sym. commenced to fall, and at 2 30 P.M., bar. 29·7, ther. 72°; we at once shortened sail to close reefed topsails and foresail; it blew very hard with a heavy sea, which stove in part of our weather bulwark. From the strange appearance of the sky, the rapid fall of the glasses, and the air being so much more warm and sultry than usual, I was afraid we were in the S.E. quadrant of a regular cyclone, or circular storm, and, if such were the case, being nearly in front of it, I began seriously to think of running away to the south, so as to avoid the centre; but at 4 P.M., bar. still at 29·7, and only blowing a heavy gale, (at true N.N.E.,) and taking into consideration the path and rate of storms in this region, I

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still continued standing east, carrying all possible sail, with the determination to run south 40 or 50 miles if the weather became worse and bar. falling. But after midnight we had rather less wind, though the bar. did not rise; I now carried a press of sail (the wind being now at true north) to endeavour to make some northing, and keep ahead of the storm; for while we made northing, and the cyclone coming slowly up with us, the wind would become more westerly, so that with a little carrying on, we should get into the favourable quarter of the storm for our passage; while if we ran to the south of it, we should lose no time. Every rope and spar was creaking again, as the sailors say; but, with unutterable satisfaction, I found the wind gradually veering more westerly as it increased, on the forenoon of the 10th. At noon it was rather hazy, strong gales at N.W.b.N., under a press of sail, lat. 39° 20′ S., long. 61° 36′ E.; bar. 29·6, A. 71° W. 64°; at 1 P.M. a dense haziness surrounded the horizon; the wind and sea were rapidly increasing. The clouds, at times seen through the lower thin misty streaks that were driving with immense rapidity to the eastward, appeared careering to and fro with great velocity, and rapidly changing their form and appearance; some were lurid, others leaden coloured, and some dense black, and threatening; some appeared to be blown in pieces and melted away, others kept their lurid and black denseness to the edge, contrasting wildly with the livid brilliancy of the sky beyond. We immediately took in all sail to close reefed topsails; at 4 P.M. it blew tremendously hard in gusts, with showers; and in the meantime the wind had veered to W.N.W. at 5 P.M., the wildest appearance of the sky and heaviest black clouds being then to the south of us. At 2 P.M. the bar. had risen, and that before we had the heaviest of it. The veering of the wind occasioned a tremendous heavy and confused sea; after 4h. it became rather

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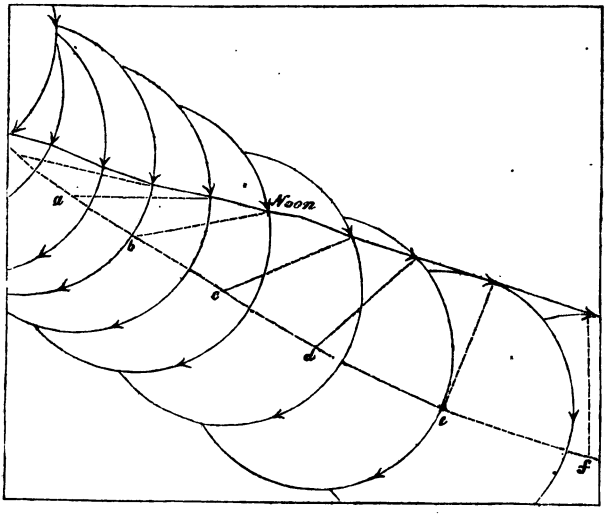
more moderate and clearer, and the bar. rose rapidly; we now set more sail, so as to follow up the storm and take all advantage from it now we were on the right side of it; at 9 P.M. the wind W.S.W. (true) 8, 9, 6, c., bar. 30·0, and next day we were running east with all sail, the wind W.S.W. and W.b.S., a very heavy sea from the W. and S.W.

On projecting this storm I find its course and velocity to be about E. or E.b.S. 12′ or 15′ an hour; but we must have been too near the centre for the results to be very correct, as it is impossible to say how the wind might have been to a point.

Barque "Trident" gaining the North side of a circular storm.—March 10th, 1851.



This was a judicious manœuvre on the part of the Commander of the *Trident*, by which, as he says, he

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H.	K.	Courses.	Winds.	Strgh	Weather	Bar.	Th	Sym.	A.	W	REMARKS, Monday, March 10th, 1851.
1	3	ESE	NE ½ N	9 ·8	md	29 ·7	71	29 ·7	70	64	Close hauled under two close-reefed topsails, and fore-
2	3	"	"	8 ·7	md	"	"				topmast staysail; a heavy cross sea, shipping a great deal
3	3 ·5	"	NE bN	7 ·8	mpd	"	"				of water; washed away part of the larboard bulwarks.
4	4	EbS ½S	NNE	7 ·8	mbc	"	70	"	69	65	At 2 A.M. set the main staysail and trysail. At 4 A.M.
5	6 ·5	ESE	"	7 ·8	mc	"					set the reefed foresail, and let one reef out of the topsails;
6	7	"	"	7 ·8	mbc	"		29 ·65			kept away well full, and eased the lee-braces.
7	7 ·5	EbS ½S	NbE	7 ·8	mbc	"			71	64	At 8 strong gales and heavy sea; set more sail; em-
8	8 ·5	"	"	7 ·8	mpd	29 ·65	71				ployed securing the yards and masts, with preventer
9	8 ·5	EbS	"	7 ·9	mpd		72	29 ·62			braces, stays, and tackles. Towards noon worse weather
10	8 ·5	"	N	8 ·9	mbcpd	29 ·60	71	29 ·55	70		and a very heavy sea, washing away bulwarks, &c.; the
11	8 ·5	"	"	8 ·9	mbcpd	29 ·58	"	29 ·52			decks filled with water at times. Pumps carefully
12	8 ·5	"	NbW	8 ·9	mbcpd	29 ·55	"	29 ·62	69	64	attended to. Variation 2½ points W.

Course.	Dist.	D. Lat.	Dep.	D Lon.	Lat. Obs. 39° 21′ S.	Long. Chr. " "	Bearing and Distance at Noon.
80° E.	115	19 ·7	113 ·5	146	Lat. Acc. 39° 19′ S.	Long. Acc. 61° 36′ E.	Amsterdam Island N. 83° E. 760.
Log Dist.	117	Curr	"	"	Cou. & Dist. made good.	N. 80° E. 115.	

H.	K.	Courses.	Winds.	Strgh	Weather	Bar.	Th	Sym.	A.	W	REMARKS, Monday, March 10th, 1851.
1	8 ·5	EbS	NbW	8 ·9	mbcpq	29 ·65	70	29 ·7	69	64	P.M. Rapidly increasing gale, and wind veering west-
2	9	ESE	NNW	10 ·9	"	29 ·72		"			erly. Dark and threatening looking clouds seen through
3	9 ·	"	NW bW	11 ·9	"	29 ·75		29 ·8			the driving mist, flying with great velocity to and fro,
4	8 ·5	EbS ½S	NW	11 ·9	"	29 ·8		29 ·9			and changing their forms very quickly. Took in sail to
5	8 ·5	"	NW bW	10 ·9	"	29 ·82		30 ·0	67	63	close-reefed topsails, and kept the ship before the wind.
6	8 ·5	"	"	10 ·9	bcpq	29 ·93		"			A very heavy and confused sea, the ship taking a
7	8 ·5	"	WNW	8 ·9	"	30 ·02		30 ·02			great deal of water on board.
8	8 ·75	"	"	8 ·9	"	30 ·05		"			At 9 P.M. less wind. Clear above, and dense black
9	8 ·75	"	W	8 ·9	"	30 ·05		"	60	63	clouds round the horizon, heaviest and wildest looking to
10	8 ·75	"	"	8	bc	30 ·05		30 ·1			the southward. Let one reef out of the topsails, and set
11	8 ·5	"	"	7 ·8	"	30 ·00		"			the foresail. Towards midnight better weather; set more
12	8	"	"	7 ·8	"	30 ·00		"	56		sail. J. LYALL.

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gained the safe side of the storm and a fair wind also. With the view of assisting our reader we have laid down the track of the *Trident*, and at each direction of the wind in the log annexed have laid off the bearing of the focus, and assuming it to be at the same distance at each observation, have marked its position by the letters, *a*, *b*, &c. It will be seen that the rate at which it was travelling was greater than that of the *Trident*, a remark which applies generally.

55. We have alluded (see art. 7) to several instances of hurricanes being met with on their southern course as far to the eastward as between 80° and 90° of East longitude far out of their usual track which is generally between Rodriguez and Mauritius or near those islands. The following account of one with which we have been favoured by Captain Robertson, the master of the *Equestrian*, built by Messrs. Soames of Blackwall, affords an important illustration of much that we have advanced, and an instructive lesson on the necessity of being nervously alive to the indications of the barometer in any part of the hurricane district eastward of Rodriguez even as far as 90°. Captain Robertson's interesting account runs thus:—

SIR, Ship *Equestrian*, London, June, 1852.

Having during my passage from Calcutta to the West Indies in December last, with Coolies, encountered a severe hurricane, which progressed differently from the course they are supposed usually to take in the Southern Indian Ocean, and by which we incurred some severe damage, I take the liberty of giving you, as briefly as possible, the particulars.

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Departure. On the 3rd December, in the evening, we left the sandheads, having upwards of 350 souls on board. In ten days we crossed the line in about 83° E.; had no westerly monsoon until the 20th, in lat. 9° S., when it came from S.W., with thick rain and squalls. On the 21st, in 10° S., the wind hauled more westerly, but still continued squally, and we observed several cross swells from N.E., N.W., and S.E.; they were long and considerably high, and did not appear to interfere with each other. At the same time in the S.W. quarter there was a thick mass of clouds, having a heavy leaden hue; they were huddled up and rolled over each other. Not liking their appearance, we made immediate preparation for bad weather; sent down the upper yards, took three reefs in the topsails, and furled all except the fore and main topsails and foresail. The wind now veering to the north, kept S.S.E. My barometer, which I had always found to act well, had kept ranging between 29·90 and 29·75, according to the atmospheric tides, and up till the 23rd at 4 A.M., when it fell to 29·55, the wind was then N.N.E. and blowing stiffly. The gloomy appearance seen to the westward was drawing more on the quarter, but more dismal still. This we could only see at intervals, the atmosphere around being so thick. The sea had now risen so high as to prevent us from keeping the wind more than a point or two on the port quarter, our hatches being partially open. Towards noon, this day, the glass rose again to its usual range 29·80; we watched, but could observe none of the signs indicating a hurricane spoken of, viz., lurid red skies, &c., &c., but we could distinctly hear the wind moan as it swept through the rigging, and it seemed to have a very hollow sound. I was fully convinced we were now on the border of a cyclone, but thought from the bearings of the bank of clouds to N.W. corresponding with the wind nearly N.E. to place us on the

Commences with S.W. wind.

Hurricane wave.

Making a snug ship.

Wind veers to north.

Becomes N.N.E.

Bank drawing aft and increasing in density.

Wind & sea increasing.

Bar. rising.

Moan of the wind

Ship in the S.E. quarter of the storm.

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S.E. edge, and the usual tracks in this sea, we could run no danger by adopting the rule (para 135 of Piddington) and run round the storm, the more especially as our rigging was all nearly new and spars good. Determines to run round the front of it.

I had also a vivid recollection of the severe treatment we received on a similar occasion, and in nearly the same place, during our passage home last voyage, in March 1850, with invalids on board, from Bombay. We then hove to to avoid running into a severe hurricane to the West of us. We pitched away fore-topmasts, plunged forecastle and bowsprit under and took away the jibbooms and all the head gear, filled the decks, and as the hatches were partially open we ran an imminent risk of swamping until we got her off again, and subsequently sailed round without further trouble or risk, for, fortunately for us, that storm was moving to the West. Former experience. Effect of lying by.

On the morning of the 24th the weather was very dirty, the wind strong at N.E. and sea so high, we were compelled to run nearly right before it. The glass was still stationary. During the forenoon the eastern sky cleared away, the sun came out, and I obtained for the first time for several days good sights for latitude and longitude. These were as follows, viz., lat. 15° 20′ S., long. 85° 0′ E. As the sky kept open to S.E. and East the greater part of the afternoon, I had great hopes we were fast getting out of harm's way, and I assure you this considerably lightened a heart not wholly at ease with the care of 350 souls. These hopes were doomed to be short lived, for about 4h. P.M. the barometer was observed falling, but being about the time of its lowest tide range, the warning conveyed by it was not so apparent. At 5h. P.M., it still continued to fall, showing no time was to be lost in making our final preparations. We close reefed and re-secured the furled sails, got extra sheets on the foresail, Wind N.E., sea high. run S.W. Bar. steady. Obs. obtained. Partial clearance of the weather. Bar. falls. More preparations for the

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Hurricane.

battened down the hatches, and mustered all the axes in the cuddy, and this work was barely completed ere it came astern thick and heavy, the rain in torrents beating down and against the masts with amazing force, and the gusts of wind howling fearfully as they swept through the rigging; it became perfectly dark considerably before its usual time. At 8h. P.M. the glass 29·40; the ship groaning fearfully as she flew before the tempest. At 9h., by the light thrown upwards by the foam, we could see the main topsail giving way: with much difficulty it was got in, but the storm was still increasing in violence. At 10h. the foresail blew into ribands and was gone in a few seconds; the foretopsail soon after followed, but so densely thick and dark was it that we were not aware of the exact moment of its departure. We had a hope in the storm main trysail, but, although stretched against the main rigging, it was blown into tatters in a short time and we were left in the total power of the maddened elements, which were roaring and howling fearfully over the ship as she rounded to. The pumps now required all our attention, and in this state we lay all night. The daylight did not diminish the horrors of the scene, but ushered in a most dreary Christmas day; the wind was gradually veering round to South from E.N.E. at 10h. P.M., and with increased violence; at 8h. A.M. the barometer was 29·10.

Total darkness

Ship scudding and complaining.

Got the main-topsail.

Storm increasing.

Sails blown away.

Helpless condition of the ship.

Recourse to the pumps.

Wind veering from E.N.E. to South

Bar. lowest.

At 10h. A.M. the mizen topmast, unable to bear its force longer, came down bringing all the yards, gaff, and part of top with it, and to be brief at 1h. 30m. P.M. the head of the mainmast was wrung off close to the rigging, and down came the mainyard with a fearful crash, as it smashed across the bulwark. At this time the storm was at its height, and seemed appeased with the ravage it had done to us; for by the time the wreck was cut away a visible change was taking place, the wind abating, the western sky clearing, and dirt

Mizen topmast carried away.

Head of the main mast wrung off.

Ship to the N.W. of the Focus.

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and gloom settling to the S.E. the wind veering to S.W., we were now evidently on the storm's N.W. border.

After carefully considering the storm, the shifts of wind, the ship's course and drift, and other attendant circumstances, it was evident to me that this cyclone had for the first two or three days been moving to the S.W., and suddenly on the afternoon of the 24th diverged to the S.E.; this is a circumstance deserving attention, for had we hove to we should most certainly, although unconsciously, have laid ourselves in its path. As it was the few hours run we had, until bereft of sail, barely carried us clear of the vortex, which, considering the violence we experienced, must have been fearful to contemplate.

Alleged course of the hurricane.

On the 26th our sights placed two degrees West of our position on 24th and the same latitude; this is barely what I should have allowed as a dead reckoning, showing we had not been influenced by either storm wave or storm current, and we had with all the changes experienced a strong and continued press of wind without lulls or sudden gusts.

Position of ship.

Not affected by storm wave.

I think I have now stated all the particulars, and hope I have been sufficiently explicit.

The *Equestrian* was well ventilated, having, besides two patent government ventilators, two large bell mouthed iron ventilators, made by Mr. Jessop of Calcutta, and large hatch up through the cuddy, and a similar one through the top-gallant forecastle; and the morning after the hurricane, when all were turned on deck for the purpose of cleansing and fumigating the 'twixt decks, only four were unable to come on deck without assistance: three of these were sick cholera patients, and the other a female who had lost her husband from cholera, and was inconsolable; she with two of the others died a few days after, and the fourth lived a month, probably the fright of the storm gave him that respite; and

Equestrian's fittings.

Proceedings

Effects.

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on our arrival at Trinidad after all our troubles we landed our coolies in better condition and with less mortality than either of the previous ships this season.

I am, Sir,

Your very obedient servant,

JOHN ROBERTSON,

Master of the *Equestrian*.

56. We have added, in a following page, the accompanying little chart, showing the track of the *Equestrian*, with the progress of the storm as it gradually overtook her until she passed through it on the 25th of December.

57. The first important practical lesson to be gained from the foregoing narrative is that of being prepared to meet these hurricanes on their *southern* course in the early part, and far to the eastward, of their usual track, and on first meeting them to stand out of their way. The *Equestrian* might have done this on the 20th of December, when the wind was S.W. A day's run to the N.W., behind the storm, would have removed her far away from this hurricane, or when she had the wind at North she might have stood to the eastward, and then run clear of it. Captain Robertson freely admits all this but preferred keeping his course, having had some experience of hurricanes, and expecting perhaps from it to keep the meteor to the N.W. of him, not imagining it was really moving on its southern course. And therefore the *Equestrian* ran on until finding this was the case, as a last resource, she was compelled to take her chance and run across the front of it. The consequences of so doing are graphically

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described in the above painfully interesting letter. The hurricane wave,—the distinct moaning of the wind showing a highly electrical state of the atmosphere,—the bank of clouds in the S.W. so distinctly observed, were all evident signs of the proximity of the hurricane; and those too were confirmed by the changes of the wind. But Captain Robertson has done a good service to his brother seamen in thus giving them the result of his experience of this hurricane, for it is important as confirming those few exceptions to the general rule by which they curve to the southward between the Mauritius and Rodriguez. He has shown the necessity of being prepared, while in the hurricane district of the Indian Ocean, to meet them *on their southern course* any where in that district; and that it is better to haul out of their way to a respectful and safe distance as soon as they are discovered, if behind them to the N.W. all the better as their track is better passed behind them, but if not to the S.E. He has shown that the commander of a ship must not be misled by the hope that they will keep on their W.S.W. course until they arrive at their usual turning point, near Rodriguez or the Mauritius, but to consider that when he discovers himself to be in company of his blustering enemy to the westward of him, he will be obliged to cross his track sooner or later, and it is better therefore to do so without his presence than with it; it is better to yield the precedence to such a companion and let him pass on instead of running a race with him; for the further he runs the more certain is his danger.

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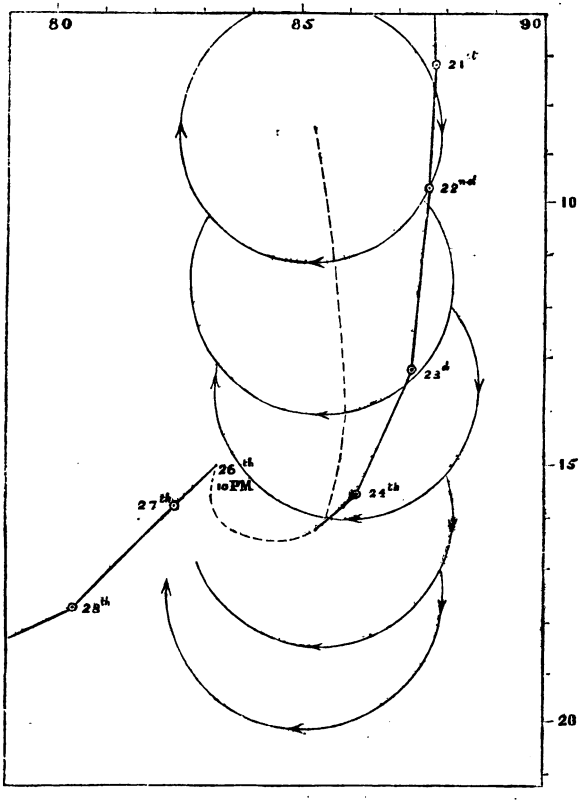
Equestian's storm of December, 1851—passing through it.



In conclusion we annex to the above little chart an extract from the *Equestrian's* log on these memorable days for the consideration of the reader.

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Extract from the Log of the Ship "Equestrian," on a passage from Calcutta to the Island of Trinidad, West Indies. J. Robertson, Master.

H	K	F.	Courses	Winds.	L W	Remarks on Monday, Dec. 22nd, 1851.
2	7		S.S.W.	W.N.W.	0	A.M. Fr. br. & cldy. with hvy. rn. At 2hd. sqlls. In
4	7	4				mn. t gt sail & mn. t.mst. st sl. At dylt. f. br. & cldy.,
6	7	4		N.W.	0	with sqlls. of wd. & rn.; one ship in cmpy. At 8 wd.
8	8			P.sp.16 i.		drwg. more aft & clg. up a little; set t.gt. s. & mn. sl.
10	8	4				At 9, hvy. sqlls. In fore & mizen topgt. sls, & stwd.
12	8	4	S.b.W.	Nrthly.	0	fore & aft sls. Noon, strg. wds. with dk. cldy. wr.
						Lat. obs. ⊙ obsd. Acc. 9° 53′ S. Long. acc. 87° 35′ E.
2	8	4	South	North	0	P.M. Strg. winds, with a very thrtng. appearance
4	7					to the nthwd. Frld. mn. topgt. sail, mn. sail, and sent
6	7			N.b.E.		rl. yds. down. At 4 do. wr., glass flg. very fast. In 3
8	6	4				reefs of fore & mn. topsl., and frld. msn. topsl. At 8,
10	7	4		P.sp.14 i.		strg. wds. & cldy., with rn. At 10 clrg. up to wdwd.
12	8	4	S.b.W.	N.N.E.		Set mn.sl. & msn. t.sl. Midt., fr. br., fine clr wr. to
A female emgt. deptd. this life.						wdwd. Out all reefs of mn. t sl. and one of fore t.sl.

H	K	F.	Courses.	Winds.	L W	Remarks on Tuesday, Dec. 23rd, 1851.
2	9		S.b.W.	N.E.b.N		A.M. Strg. wd. with fine clr. wr. to wdwd. At 4
4	9					cldy., with passing sqlls. Daylight, set the mizen and
6	9			N.E.		jib. At 8, strg. brs. with passing sqlls. of wd. and rn.
8	9			P.sp.15 i		During the whole forenoon strg. brs., with continued
10	9	4				squalls of wind and rain. Noon, ditto wr.
12	9	4				Lat. obs. S. obsd. Acc. 13° 95′. Long. acc. 87° 8′ E.
2	9		S.W.b.S.	N.E.		P.M. Strong winds and cloudy, with a rising sea.
4	9					At 4, ditto weather.
6	8					At 8, increasing wds. and cloudy wr. In two reefs
8	8					of the topsails.
10	8		S.W.	N.E.b.E		Midnight, strong winds and cloudy weather.
12	8					

H	K	F.	Courses.	Winds.	L W	Remarks on Wednesday, Dec. 24th, 1851.
2	8	4	S.W.	E.N.E.		A.M. Stg. wds. with high cross sea; ship labouring
4	8	4				very much. Daylight, do. wind, with hvy. rn. At 8,
6	8	4				fiucrsg. winds, with a rising sea; furled the mn sail
8	8	4		P.sp.16 i.		and msn. topsl. and jib. Noon, very stg. wds. with
10	8	4				ahigh sea; ship labrg. heavily. Lat obs. 15° 30′ S.
12	8			Easterly		Acc. 15° 40′ S. Long. Acc. 86° 48′ E.
2			S.W.b.W	Easterly		P.M. Wind from the Eastward, blowing a strong
4						breeze with a very high sea from E.S.E.; steering
6						from S.W. to W.S.W. to keep the wind on the port
8						quarter. At 5 close reefed the topsails. At 6 squally
10						hard gusts with thick rain, and sea getting higher.
12						

H	K	F.				
			W.S.W.	Easterly		At 8 the sea like a mountain, and the wind very

strong about East. Forced to keep the ship edging to W.S.W. before the swell, to prevent being pooped or the decks swept. At 9 the wind increasing in hard gusts, split the main topsail; sent the hands aloft to secure the remains. At 10 the foresail went, the wind still increasing, with torrents of rain. At 11 the fore topsail blew out of the bolt ropes clean away. Midnight, blowing a hurricane, with an amazing high sea, the ship labouring as she lay over to the wind; the main trysail was tattered to rags, and the ship would not lay to for want of an after sail, all being now gone.

JNO ROBERTSON,
C. TACHE, Chief Officer.

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A.M. During the night the wind and sea still increasing, and the ship helpless and making a deal of water. At daylight it was blowing with fearful violence, it being utterly impossible to face the wind, the masts bending and swinging awfully with the lurches of the ship. At 10 A.M. the mizen topmast went by the cap, carrying with it part of the top. Noon, the hurricane was at its height, and raging with inconceivable fury, the air being enveloped as with smoke with the drift and rain; since midnight the pumps have never been left. At 2 P.M. the mainmast went, and the mainyard came down across the ship with great violence and broke in two. All hands employed with axes, &c., clearing away the wreck, which was now beating violently against the sides and under the quarter, tearing away the main channels and damaging the sides; the starboard quarter-boat was also taken away. By this time the wind had hauled to S.S.E., veering gradually from E.b.N., and blew with its greatest violence from S.E. to S.S.E. At 6 P.M. it began to moderate, and the ship to lighten a little; kept plying the pumps. At 8 found nearly 5 feet in the well; the ship still labouring very much with the high confused seas. Midnight, the pumps gained a rolling suck. During the violence of the hurricane many of the sails which were stowed and made well fast in anticipation of bad weather, were blown to rags in the gaskets. At noon the barometer at 29.10.

Our loss is as follows, viz.:—Mainmast gone by the head, and main yard; main top-mast, yard, sail, rigging, and gear; main topgallant-mast, yard, sail, rigging, and gear; mizen topmast and rigging cut away, yard saved; mizen topgallant-mast, yard, sails, rigging, and gear; fore topsail; foresail and mainsail; jib and main trysail; starboard and quarter boat; the gangway rails on both sides broke, stantions started, (water way), seams opened, and the ship much strained, besides sundry running gear, studding sail, boom, &c., &c., which went with the storm.

JNO. ROBERTSON,
C. TACHE.

H	K	F.	Courses.	Winds	L W	Remarks on Friday, Dec. 26th, 1851.
2			Ships hd.	S.W.		A.M. Strg. wds. with very high confused sea; ship
4			to N.E.			rollg. heavily, At 4 do. wr.; pump ship every two
6						hours. Daylight, opened the upper deck hatchways,
8			Nrthwd.	Wstrly.		found a good drop of water between decks. At 8
10						strong winds, with a very high confused sea; ship
12						rolling heavily. On looking round the ship found all
One of the male emigrants departed this life.						the head-gear carried away, and some of the copper ripped off on the port side.
2			N.N.W.			Noon, ditto wr.; all hands empd. reftg. and settg.
4						up the hd. gear, bending a fresh foresail, fore topsl.
6			N.N.E.	N.W.		and jib, and getting the mizen gaft aloft. At 4 set
8						the mizen and jib. At 8 fresh breezes, with a high
10	2		S.W.			confused sea; ship rollg. and ptchg. very hvly. At 10
12	3					ship more stdy; set fore topsl. Mdt fr. brs. & cldy.

JNO. ROBERTSON,
C. TACHE, Chief Officer.

H	K	F.	Courses.	Winds.	L W	Remarks on Saturday, Dec. 27th, 1851.
2	3		S.W.	N.Estrly		A.M. Fresh breezes, with a very confused sea; ship
4	3	4				rolling heavily. At 2 set the foresail. At 4 fresh
6	4	4				breezes with less sea, but ship still rolling very hvly.
8	5			P.sp.18 i.		Daylight, washed and cleaned the upper deck and
10	5					getting the deck a little clear; set the fore topgallt.
12	5					sail. At 8 fr. brs. and fine, ship rolling heavily; set
One woman, two men, and one infant departed this life.						the port head studding sails. Noon, do. weather. Lat. Obs. 15° 53′ S. Long. Chron. 82° 22′. E.
2	6		S.W.½S.	N.E.bE.		P.M. Fresh brs. with clear wr.; ship still rolling
4	6					very hvly., there still being a very high swell; crew
6	7					employed crossing the foreyl. yds., fitting new mizen
8	8			P.sp.12 i.		topmt. rigging, repairing the mizen rigging, and other
10	8			E.N.E.		necessary work for setting sail; set the mizen topsail
12	8					for a croggie sail. Midnight, ditto weather.

JNO. ROBERTSON,
C. TACHE, Chief Officer.

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APPENDIX.

Note I. p. 20.—In treating on the important subject of avoiding a Hurricane some years ago in the *Nautical Magazine*, we gave the following rule for knowing the bearing of the centre.

"We left you with the first fair wind of a hurricane, from which you were to ascertain at once the direction of the focus from you. The method we gave you was good and simple, but perhaps the following may be more so. Turn your back to the wind; then if you are in North latitude the focus will be on your left hand, but if you are in South latitude it will be on your right; in both cases at a right angle from the direction in which you are looking. This rule holds goods, you will perceive from the very nature of a whirlwind, in all parts of it clear of the focus. Having determined the direction of the focus from you, the next step to be taken to avoid it depends on the part of the hurricane circle on which you find yourself to be, along with the direction in which it is travelling. Your principal object is to avoid the focus as you would a waterspout, and to do this you must *give up all idea of keeping your course*, even should the hurricane wind which you have be fair. Make a fair wind of it if you like, but not to run into the focus. The *Pluto* and *Maria Soames* did this, and both suffered for it. Let us suppose you were on board the *Pluto* (in north latitude) when she had her first hurricane wind from E. and E.S.E. Turning your back on the wind, and facing yourself W.N.W., would have given you the focus of the hurricane on your left hand, at a right angle S.S.W. of you. It would then be clear to you that standing down to the southward would be the worst course you could adopt, as it would

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take you into the middle of the storm; and knowing that the hurricane was travelling to the westward, as the hurricanes of the China Sea, and indeed all hurricanes do, you would have immediately put your ship's head to the N.E., and have sacrificed a day to get out of the way of it."—*Nautical Magazine*, 1846, p. 651.

The passage has also been transferred by Mr. Piddington, into his "Horn Book," as another means of finding the bearing of the centre. Still we prefer our last, given in art. 26, for the seaman may remember readily, as his starting point, that the wind of the hurricane circle in both latitudes next the Equator is always from West; then marking his position on that part of it to which a tangent line would show the wind as he has it, he sees immediately the direction in which the centre bears from him, without troubling his memory about his right or his left hand, which necessarily apply each to one hemisphere only. The cases of the *Pluto* and *Maria Soames* alluded to are among the remnants of the want of information on the Hurricane Theory which formerly prevailed.

NOTE II. p. 29.—Sir William Reid proposed to us, while his work on the "Law of Storms" was going through the press, the use of a transparent card to represent the hurricane circle, a plan which Mr. Piddington has preserved in horn, hence his valuable "Horn Book." But he would have found *one* sufficient, by merely turning it over on the North and South (or meridian) line, thus making the North point South and the South point North, the East and West points remaining the same. It would then represent as well as before the hurricane wind for the southern hemisphere. The seaman would find this a convenient and useful article.

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ERRATA.

The reader is requested to make the following corrections of the press.

Page 41, art 51.—"Suppose a vessel to be steering" *for* "S.W." *read* "West." Also in the fifth following line, *for* "S.W." *read* "West."

Page 42, art. 52, line 6 from top, *for* "Soutward," *read* "Southward."

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